REMARKS

Claims 1-6 are pending in the present application, with claims 1 and 4 being amended and claims 5 and 6 being added by this amendment.

Claims 1 and 2 are rejected under 35 U.S.C. 102

Claims 1 and 2 are rejected under 35 U.S.C. 102(e) as being anticipated by Launey et al.

The present claimed invention is a voice control system for a consumer electronics device with one or more external loudspeakers, using a microphone array. The voice control system includes a plurality of microphones for converting a detected signal to electrical signals. One or more microphones are integrated in the external loudspeakers. A central signal processing unit is connected to the plurality of microphones. The signal processing unit scales or processes the electrical signals according to the respective position of the microphones relative to the user. The respective position of the microphones is given by different propagation delays. A central speech recognition unit converts the electrical signals from the signal processing unit into operational commands for the consumer electronics device.

Amended claim 1 specifies the device to be a consumer electronics device. The appliances connected to the device are external loudspeakers, and thus "passive" appliances that are usable only together with the device. Though these loudspeakers can be connected to the device via a bi-directional network, e.g. IEEE 1394 bus, as mentioned in the specification, it is also possible to connect them simply via an analogue connection without bus protocol. The signal processing and speech recognition units are centrally located in the device itself, as claimed and mentioned on page 2 of the specification and shown in the figure. This is the most useful location for two reasons: first because the signal processing unit is connected to all available microphones in order to optimize spatial separation and second, because the external loudspeakers may be optional appliances, as for most TV sets. When no external loudspeakers are connected, then the speech recognition can still be performed with reduced efficiency, using only microphones that are internal to the main device, as mentioned on page 3 and shown in the figure.

Further amendments in the new claim refer to the signal processing unit and the connection type of the external loudspeakers. The signal processing unit is specified to scale or process the electrical signals according to the respective position of the microphones relative to the user. This position is given by different propagation delays of the speech signal to the different microphones. Finally, the external loudspeakers may also be connected via a wireless or radio network.

Launey, in contrast, discloses a system where multiple speech recognition locations are used to control, not the center of the network, but the respective appliances, through use of a central processor, and therefore each speech recognition unit is located at its respective appliance. This system requires communication buses, i.e., a home network, between the appliances and the central processor. The system is useful if appliances are located in different rooms, so that due to the central processor the user may have control over appliances being located in another room. In other words, the system of Launey establishes a relatively small distance between the microphone and the user, since the purpose of the distributed microphones would be to use the microphone that is nearest to the user, and ignore the others. This is contrary to the present claimed invention which enables voice input from a relatively great distance, meaning that the speaker is still within the same room as the microphones and the device that should be controlled. For the consumer electronics devices that are mentioned as examples, like a TV set, VCR or satellite receiver, it is typically the case that the speaker who gives voice commands is in the same room as the device and the external loudspeakers. It would be of no use if the user was in another room, and therefore usually the microphones should be in the same room as the device to be controlled.

When the microphones are in the same room, they usually receive the same acoustic signal from the user, with small phase differences according to the users and the microphones position. This is essential to the present claimed invention since the phase differences are evaluated by the signal processing unit. The main purpose of the signal processing unit of the present claimed invention is to combine the signals that are received from all connected microphones.

The described measurement and calibration operation, wherein a test signal tone reproduced by the loudspeakers is detected by the microphones, and the relative position of

the appliances, and thus the microphones, is determined from the different propagation delays, results in a zone of highest sensitivity for speech input. This zone is also the zone where the sound that is reproduced by the loudspeakers is optimal. Since the loudspeaker boxes will usually be positioned such that this zone is also the most probable user location, the microphone array in the present claimed invention focuses on the user. Background noise coming from other directions is detectable by different propagation delays in the present claimed invention, and can thus be eliminated by the signal-processing unit.

Launey et al. teach a signal processor unit for processing the output signal of microphones, as cited by the examiner, which addresses the problem of background noise (col.12, lines 60-65). However, the solution to the problem of background noise taught by Launey et al. is a system with "enhanced performance" (col.12, lines 64-67), namely "certain hardware, together with software" (col.12, lines 66-67). What Launey et al. discloses is "a voice recognition system...accomplished by means of the central processor and its interconnection [...] to a speech processor which in turn is connected to a remote microphone" (col.13, lines 3-7). This must be understood as a single standard microphone, as is explicitly mentioned in col.13, lines 26-28. The mentioned Crown PZM microphones have no directional characteristic, but a hemispherical polar pattern (see www.crownaudio.com/mic_htm/pzm.htm). Even if more than one of these remote microphones is connected to the speech processing unit, as mentioned in col.10, line 7, and implicitly shown in Fig.1, this will not automatically lead to a directional characteristic, or even the effective suppression of background noise as in the present claimed invention. Instead, Launey et al. pursue another goal with using multiple microphones, namely "multiple voice recognition locations" (col.15, line 37) when describing a home automation system that uses "different types of devices in different parts of the home" (col.15, lines 14-15).

Contrarily, it is an essential part of the present claimed invention to use a microphone array. A person skilled in the art of electro-acoustics understands a microphone array as mentioned in e.g. United States Patent No. 6,317,501, filed on March 16, 1998 and United States Patent No. 4,311,874, filed in 1979. A copy of each of these patents was cited in an Information Disclosure Statement submitted with the response to the Final Office Action on July 14, 2003 for the courtesy of the Examiner. Although referring to only two documents, the applicant will provide additional documents containing evidence for the understanding of the technical term "microphone array" if requested by the Examiner.

According to the first mentioned document, a microphone array is a "plurality of omnidirectional microphones" defining "a directivity by emphasizing a target sound and suppressing noise". Further, the microphone array apparatus is capable of detecting the position of a sound source on the basis of a relationship among the phases of output signals of the microphones" (col.1, lines 10-16). The technical solution is that "the speech of the speaker can be emphasized by adding the phases of speech components" (col.1, lines 21-22).

US 4,311,874 explains that "the ambient noise signals picked up by the microphones add incoherently while the speech signals add in phase. The result is that the array has a much higher signal-to-noise ratio than a single microphone or several arbitrarily placed single microphones" (col.1, line 65 - col.2, line 2).

The directivity of a microphone array depends, among other things, on the distance between its single microphone components. The higher the distance, the higher the phase differences, and the better the directivity. While the plurality of microphones used for a microphone array in prior art applications was always integrated into a single device, the inventors of the present claimed invention recognized for the first time how the positioning of at least some of the microphone components can exceed the dimension of the voice controlled device, thus improving the directivity of the microphone array. Advantageously, the microphone components are integrated into existing appliances connected to the voice controlled device so that no additional installation is required.

It is particularly advantageous to use loudspeaker boxes for this purpose, as described in the present claimed invention to be the preferred embodiment, because the orientation of loudspeaker boxes is usually optimized for a favorite user position. Furthermore, this is an easy way to eliminate the sound coming from the loudspeakers in these boxes.

For a person skilled in the art it is therefore clear that Launey et al. deals with single or multiple microphones, but not with microphone arrays. Therefore, it is respectfully submitted that the claimed enhanced voice control system using a microphone array is neither mentioned nor suggested by Launey et al.

In view of the above remarks it is respectfully submitted that Launey et al. does not anticipated the present invention as claimed in claims 1 and 2. It is thus further respectfully submitted that this rejection is satisfied and should be withdrawn.

Claims 3 is rejected under 35 U.S.C. 103

Claims 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Launey et al. in view of Lea.

Lea recites a home audio visual network defining an open architecture for interoperating consumer electronic devices. The architecture allows for devices from different manufacturers to interoperate. Lea was cited to show a bi-directional network based on an IEEE 1394 bus. However, Lea neither discloses nor suggests the enhanced voice control system using a microphone array of the present claimed invention. It is thus respectfully submitted that Lea adds nothing when taken alone or in combination with Launey et al. that would make the present claimed invention unpatentable. It is thus further respectfully submitted that this rejection is satisfied and should be withdrawn.

Claims 3 is rejected under 35 U.S.C. 103

Claims 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Launey et al. in view of Stein.

Stein recites a module including a card mounted telecommunications interface which is replaceable in a conventional consumer and industrial electronics. The transceiver is able to communicate with one of a plurality of standardized wireless networks and provides audio input signals to a speaker or speakers. A microphone provides audio input signals to the transceiver. There is an arrangement disclosed by Stein, as cited by the Examiner, coupling a microphone and a speaker into an appliance being a headset, but this system is only usable by one person at a time. The system according to the application instead can be used by two or more persons, if these persons are in the focus area of the microphone array. However, Stein neither discloses nor suggests the enhanced voice control system using a microphone array of the present claimed invention. It is thus respectfully submitted that Stein adds nothing when taken alone or in combination with Launey et al. that would make the present claimed

invention unpatentable. It is thus further respectfully submitted that this rejection is satisfied and should be withdrawn.

For the reasons discussed above, claims 3 and 4 referring to claims 1 and 2 differ substantially from Lea and Stein, respectively.

In the event there are further issues remaining in any respect the Examiner is respectfully requested to telephone attorney to reach agreement to expedite issuance of this application.

Since the present claims set forth the present invention patentable and distinctly, and are not taught by the cited art either taken alone or in combination, this response is believed to place this case in condition for allowance and the Examiner is respectfully requested to reconsider the matter, and to allow all of the claims in this case.

No additional fee is believed due. However, if an additional fee is due, please charge the additional fee to Deposit Account 07-0832.

In view of all of the foregoing, it is submitted that the amended application is now in condition for allowance, and such action is respectfully requested.

Respectfully submitted,
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